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ABSTRACT

This investigation attempted to clarify the effects of different classes of reinforcement on the size discrimination learning of normal and low achieving third grade middle class boys. The classes of reinforcement consisted of tangible reinforcement, person reinforcement (praise), and performance reinforcement (correctness of response). Each of these reinforcers was presented on a reward-nothing combination basis. The results indicated that the subjects did not all respond homogeneously to a particular class of reinforcement when achievement level was considered. The low achieving boys had a higher percentage of correct responses on the learning task under tangible reinforcement than under person or performance reinforcement, while the normal achieving boys performed more effectively under person and performance reinforcement than under tangible reinforcement. (Author/TA)

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THE EFFECTS OF DIFFERENTIAL REINFORCEMENT IN THE DISCRIMINATION LEARNING OF NORMAL AND LOW ACHIEVING CHILDREN[1]

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THE EFFECTS OF DIFFERENTIAL REINFORCEMENT IN THE DISCRIMINATION LEARNING OF NORMAL AND LOW ACHIEVING CHILDREN[1]

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Intrinsic to the child-training process in our society is the manipulation of rewards to accelerate desirable behavior. The learning of basic skills and social values is strongly contingent upon the manipulation of reinforcing consequences by significant individuals in the child's environment in which teachers exert prominent influence as a consequence of their continuous and proximate supervision of children.

Whereas the child comes into the classroom with a motivation history of preferred reinforcers, the differences in motivated behavior between children are not only a function of the reinforcement history of the child but also the reward condition of the classroom in which the finds himself (Staats, 1968). In many classrooms the reward condition consists of informative feedback on classroom performance. Several studies indicate, however, that while informing a child as to the correctness of his response is an effective reinforcer for middle class children, it is less effective in attaining optimal performance among lower class children. Terrell & Kennedy (1957) found that children, many of whom were from a rural background, required significantly more trials to learn a

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"larger-than" response when presented only a light flash as an indication of a correct response than when presented candy or praise. In a later study using the same discrimination task, middle class children learned more quickly when presented a light flash than when given candy and a light flash while the reverse was the case for the lower class children (Terrell, Durkin, & Wiesley, 1959). Zigler and de Labry (1962) reported that lower class children performed more effectively on a concept switching task when a tangible reinforcer (plastic harmonica, comb, ball-point pen, model car or toy watch) rather than an intangible reinforcer (the word "right") was employed whereas the middle class children performed better under intangible reinforcement than under tangible reinforcement. In addition, there was no significant difference between mean number of trials to switch concepts for the two socioeconomic groups when each group received its most effective reinforcer. Using social effectiveness scores from a satiation task, Zigler and Kanzer (1962) concluded that reinforcers connoting praise (the words "good" and "fine") were more effective than verbal reinforcers connoting correctness of response (the words "right" and "correct") with lower class children. On the other hand, the confirmation of response reinforcers were more effective than the praise reinforcers for the middle class children. Douvan (1965) found that middle class subjects maintained approximately the same level of achievement motivation under

tangible (money) and intangible reinforcement (achieving an abstract norm) whereas the motivation of the lower class subjects dropped significantly when the material reward was absent.

Although these results are not unequivocal (McGrade, 1968; 1966; Rosenhan & Greenwald, 1965), they do suggest that children of different socioeconomic classes should not be treated as a homogeneous group in their preference for a particular class of reinforcement. If teachers attempt to promote learning of all children by using feedback or correctness of response as the accelerating consequence, it would follow from these studies that some children, e.g., lower class children, would not be positively affected by this stimulus and, therefore, would learn slowly or may actually fail to learn in school.

It is possible that differences in academic achievement among children of similar cognitive developments and socioeconomic status are due to differences in the effectiveness of available reinforcers within the classroom environment. Shores (1967) investigated this hypothesis and found that fourth grade middle class children achieving at grade level had a higher percentage of correct responses on a discrimination task under intangible reinforcement (the words "right" and "wrong") than under tangible reinforcement (candy and trinkets) while the middle class children achieving below grade level performed more effectively when presented with tangible reinforcement than when given intangible reinforcement. Shores' results are tenuous, however, since the achievement levels of the subjects were based

on a group achievement test administered nearly one year prior to the study and while the low achieving subjects were achieving at least one year below grade level as a group, individuals within the group were not performing one year or more below grade level at the time of the study (p. 77). Further, the reinforcement combinations were not comparable in that the tangible reinforcement condition consisted of a Reward-Nothing combination (presentation of a tangible reward for a correct response and ignoring an incorrect response) while the intangible reinforcement condition consisted of a Reward-Punishment combination (the words "right" or "correct" after each correct response and the word "wrong" after an incorrect response). In spite of these limitations and contrary to considerable evidence that middle class children are rather homogeneous in their preference to a particular class of reinforcement (e.g., correctness of response or performance reinforcement), Shores' findings tentatively suggest that what may constitute a potent positive reinforcer for middle class children achieving at grade level may have little or no reward value for middle class children achieving below grade level.

The purpose of the present investigation was to clarify the effects of different classes of reinforcement on the size discrimination learning of normal and low achieving third grade middle class boys. The classes of reinforcement consisted of tangible reinforcement, person reinforcement connoting praise, and performance reinforcement connoting correctness of response.

Each of these reinforcers was presented on a Reward-Nothing combination basis. It was predicted that the low achieving boys would have a higher percentage of correct responses and fewer trials to criterion under tangible and person reinforcement than under performance reinforcement. It was also predicted that there would be no difference between the effectiveness of the three classes of reinforcement for the normal achieving boys, although they were expected to learn more effectively than the low achieving boys under performance reinforcement. This latter prediction was based on a refinement of the concept of a developmentally changing reinforcer hierarchy (Rosenhan & Greenwald, 1965). According to this refinement, maturation involves increasing sensitivity to a broad class of reinforcers, especially abstract reinforcers indicating correctness of response, but without decrement in responsiveness to personal or concrete reinforcers. Further, it was predicted that there would be no difference in mean percentage of correct responses or mean trials to criterion between the two achievement groups when each group received what is for that group the most effective reinforcer.

METHOD

Subjects

Sixty third grade boys from a southeastern Michigan school district served as Ss. Only boys whose fathers' occupations were included in Levels I through IV of the revised scale of the Warner Index of Social Characteristics (Warner, Meeker, & Eells, 1960) were selected as representing middle socioeconomic status.

The normal achievement group consisted of thirty boys with a mean chronological age of 107.3 months, a mean mental age of 110.9 months as measured by the Kuhlmann-Finch Intelligence Test, and based on the Ss' composite scores from the Iowa Test of Basic Skills, a mean grade achievement of 4.2. The thirty boys in the low achievement group had a mean chronological age of 106.7 months, mean mental age of 108.7 months, and a mean grade achievment of 2.5. There was at least one year achievement difference between all Ss in the two achievement groups.

Ten Ss from each achievment group were randomly assigned to each of the three classes of reinforcement.

Task

The three-choice size discrimination task, called Find-the-Marble (Shores, 1967), consisted of a 15" X 6" plywood board with three marble holes four inches apart; three stimuli: a 3/4" box, a 1 1/2" box, and a 3" box; and a 2 1/2' X 3 1/2' cardboard screen to hid the placement of the marble.

Procedure

One marble was hidden under one of the three boxes, which was placed by E in a predetermined random order with the constraint that no marble was in the same position for more than two consecutive trials. The task required the S to learn that the marble was always under the same box. On each trial the S was allowed to pick up and look under only one box. Each S played the games until reaching a criterion of five successive correct responses or until a total of 80 responses had occurred.

The Ss in all reinforcement groups were introduced individually to the discrimination task by the following instructions:

> We are going to play a game today. The name of the game is Find-the-Marble. It is a fun game that I think you will enjoy. I am going to place this marble [E showed the marble] under one of these boxes [E pointed to the three boxes]. You are to find where the marble is hidden. Do you understand?

In addition to these instructions, the twenty Ss under tangible reinforcement received the following instructions:

> Each time you find the marble you will get to pick one of anything on this table [E pointed to the second table with various candies and trinkets] and put it in this sack [E pointed to a sack] to take with you.

For the twenty Ss under person reinforcement, the E said "Very good," "That's fine," or "You really know how to play this game" after each correct response. The E said "You're right" or "You're correct" for the twenty Ss under performance reinforcement. The E made no comment after the S made an incorrect response nor did he make any verbal comment after the instructions to the Ss under tangible reinforcement.

RESULTS

The measure of learning taken were percentage of correct responses and the number of trials to criterion. An analysis of variance was carried out on the mean scores and additional comparisons were made by use of the Newman-Keuls procedure (Winer, 1962). The mean scores and ranges for the six groups on the two dependent variables are presented in table 1.

Insert Table 1 about here

Analysis of the group means for percentage of correct responses indicated that neither main effect was significant. However, there was a significant achievement level and class of reinforcement interaction ($F[2,54] = 4.91$ $p < .015$). Comparisons between means revealed that both person reinforcement and performance reinforcement lead to a significantly higher percentage of correct responses than tangible reinforcement for the normal achieving Ss with no significant difference between these verbal reinforcers. Whereas none of the classes of reinforcement were significantly different for the low achieving Ss, they had a higher percentage of correct responses under tangible reinforcement (mean of 64.20% than under person reinforcement (mean of 55.57%) or performance reinforcement (mean of 54.04%). In addition, the low achieving Ss had a significantly higher percentage of correct responses than the normal achieving Ss under tangible reinforcement while the normal achieving Ss had a significantly higher percentage of correct responses than the low achieving Ss under person reinforcement. The normal achieving Ss were 9.17% mean percentage of correct responses higher than the low

achieving Ss under performance reinforcement, although this difference was not significant.

The results also indicated that there was no significant difference between the normal and low achieving groups on percentage of correct responses when each group received what is for that group the optimal reinforcer. The low achieving Ss under tangible reinforcement had a learning performance similar to that of the normal achieving Ss under person reinforcement and performance reinforcement.

Analysis of the number of trials to criterion revealed no significant main effects but did indicate that the achievement level and reinforcement condition interaction approached significance ($F\ [2,54] = 2.76$, $p < .10$). Although the Newman-Keuls procedure indicated that none of the treatment means were significantly different for either achievement group, the group means of trials to criterion paralleled the percentage of correct response findings. The low achieving Ss had fewer trials to criterion under tangible reinforcement than under person or performance reinforcement. The normal achieving Ss, on the other hand, had fewer trials to criterion under person and performance reinforcement than under tangible reinforcement.

DISCUSSION

The general finding of the present study was that children designated as middle class did not all have the same responsiveness to a particular class of reinforcement when their achievement level was considered. The low achieving boys had a higher percentage of correct responses on the learning task under tangible reinforcement than under person or performance reinforcement while the normal achieving boys performed more

effectively under person and perforcement reinforcement than under tangible reinforcement. This finding replicates and extends the tenuous finding by Shores (1967) that middle class children achieving at grade level had a higher percentage of correct responses under intangible reinforcement than under tangible reinforcement whereas the middle class children achieving below grade level performed more effectively under tangible reinforcement than under intangible reinforcement. However, the present results do not support the contention by Stein (1969) that the enhancing effects of positive reinforcement on achievement behavior involves more of an emphasis on generalized person-oriented approval than mere information that the child is doing a task correctly as an important goal of achievement behavior.

A reinforcer-hierarchy interpretation (Zigler, 1970, 1966) applied to the present finding suggests that the low achieving boys are developmentally lower than the boys achieving at grade level in that the former group has not made the transition from concrete reinforcers to verbal reinforcers signifying praise or correctness of response. An alternative interpretation, which questions the finding that different types of reinforcers produce differences in learning performance, suggests that the specific reinforcement procedures used in presenting the tangible rewards, that is, the subject's selection of a tangible reward following each correct response rather than the presentation of a token contingent upon a correct response to be exchanged for prizes subsequent to the completion of the task, may have

distracted his attention from the task and, therefore, deterred his learning performance (Spence, 1970). Whereas this is a plausable explanation for the poorer performance of the normal achieving boys under tangible reinforcement than under the verbal reinforcements, the removal of any distracting effects of the selection of the tangible rewards after each correct response and the institution of token reinforcement for the low achieving boys should enhance their performance since they had a higher percentage of correct responses under tangible reinforcement than under the verbal reinforcements.

The finding that the low achieving boys under tangible reinforcement performed as well as the normal achieving boys under person and performance reinforcement, which supports the finding and contention of Zigler and de Labry (1962) that there is no significant performance difference between groups of children on a task when each group receives what is for that group reinforcement high in their reward hierarchies, suggests that the learning situation should be designed to include reinforcers that are appropriate for the reinforcement system that the child has learned.

That the results using trials to criterion as the dependent measure are not more clearcut and that the normal achieving boys, irrespective of reinforcement condition, did not have a significantly higher percentage of correct responses and fewer trials to criterion than the low achieving boys may be related to task complexity. van de Riet (1964), for example, found that children who were not educationally retarded required fewer trials to

criterion on a paired - associate learning task than educationally retarded children. Whereas a total of eighty trials was the maximum number of trials permitted in the present investigation, the total number of trials required by any subject was only thirty-seven. Therefore, a more difficult learning task should better differentiate between the learning performances of normal and low achieving boys and their responsiveness to different classes of reinforcement.

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TABLE 1

MEAN AND RANGE FOR PERCENTAGE OF CORRECT RESPONSES AND TRIALS TO CRITERION BY CLASS OF REINFORCEMENT AND ACHIEVEMENT GROUP

Achievement Group	Class of Reinforcement	N	Percentage of Correct Responses		Mean Trials to Criterion	
			Mean	Range	Mean	Range
Low Achieving	Tangible	10	64.20	50.00-100.00	15.9	5-30
Low Achieving	Person	10	55.57	35.29- 75.00	17.3	11-34
Low Achieving	Performance	10	54.04	37.50- 64.29	23.0	12-36
Normal Achieving	Tangible	10	51.37	34.48- 75.00	21.8	11-37
Normal Achieving	Person	10	67.65	43.75-100.00	13.9	5-32
Normal Achieving	Performance	10	63.21	42.42-100.00	17.0	5-33